

IN THE CLAIMS:

Claim 1 and 18 are amended herein. All pending claims and their present status are produced below.

1       1. (Currently Amended) An optical communications system for communicating information  
2       comprising:

3              a receiver subsystem comprising:

4                  an optical splitter for splitting a composite optical signal having at least two  
5                  subbands of information and at least one tone into at least two optical  
6                  signals; and

7                  at least two heterodyne receivers, each heterodyne receiver coupled to receive  
8                  one of the optical signals from the optical splitter for recovering  
9                  information from one of the subbands contained in the optical signal,  
10                 each heterodyne receiver comprising:

11                 a heterodyne detector for mixing an optical local oscillator signal with  
12                 the optical signal to produce an electrical signal which includes  
13                 a frequency down-shifted version of the subband and the tone  
14                 of the optical signal; and

15                 a signal extractor coupled to the heterodyne detector for mixing the  
16                 frequency down-shifted subband with the frequency down-  
17                 shifted tone to produce a frequency component containing the  
18                 information;

19                 wherein a signal extractor of one of the at least two heterodyne receivers  
20                 comprises a bandpass filter, a square law device, and a low pass filter  
21                 and is configured to square an optical signal containing a tone and a  
22                 sideband, and wherein a signal extractor of another of the at least two  
23                 heterodyne receivers comprises two extraction paths and a combiner,  
24                 each extraction path configured to process a sideband within an  
25                 electrical signal.

26        2. (Previously Amended) The optical communications system of claim 1 wherein the  
27        optical splitter includes a separate splitter for separating each optical signal from the  
28        composite signal.

29        3. (Original) The optical communications system of claim 1 wherein the optical  
30        splitter includes an optical power splitter for splitting the composite optical signal into optical  
31        signals which are substantially the same in spectral shape.

32        4. (Original) The optical communications system of claim 1 wherein the optical  
33        splitter includes a wavelength division demultiplexer for wavelength division demultiplexing  
34        the composite optical signal into the optical signals.

35        5. (Original) The optical communications system of claim 1 wherein the optical  
36        splitter includes a wavelength-selective optical power splitter for splitting the composite  
37        optical signal into optical signals, each optical signal including a different primary subband  
38        and attenuated other subbands.

39        6. (Original) The optical communications system of claim 1 wherein:  
40              the electrical signal further comprises direct detection components; and  
41              the frequency down-shifted version of the subband does not spectrally overlap with  
42              the direct detection components.

43        7. (Original) The optical communications system of claim 1 wherein the heterodyne  
44        detector comprises:

45              an optical combiner for combining the optical local oscillator signal and the optical  
46              signal; and  
47              a square law detector disposed to receive the combined optical local oscillator signal  
48              and optical signal.

49        8. (Original) The optical communications system of claim 1 further comprising:  
50              an optical wavelength filter coupled between the optical splitter and one of the  
51              heterodyne receivers.

52        9. (Original) The optical communications system of claim 1 wherein the tone for  
53        each optical signal is located at an optical carrier frequency for the corresponding subband.

54        10. (Original) The optical communications system of claim 1 wherein the tone for  
55        each optical signal includes a pilot tone located at a frequency other than at an optical carrier  
56        frequency for the corresponding subband.

57        11. (Original) The optical communications system of claim 1 wherein at least two  
58        optical signals have tones at the same frequency.

59        12. (Original) The optical communications system of claim 1 wherein the frequency  
60        component includes a difference component.

61        13. (Original) The optical communications system of claim 1 wherein the receiver  
62        subsystem further comprises:

63              at least two FDM demultiplexers, each FDM demultiplexer coupled to receive the  
64              frequency component from one of the heterodyne receivers for FDM  
65              demultiplexing the frequency component into a plurality of electrical low-  
66              speed channels.

67        14. (Original) The optical communications system of claim 13 wherein the receiver  
68        subsystem further comprises:

69              at least two QAM demodulation stages, each QAM demodulation stage coupled to  
70              one of the FDM demultiplexers for QAM demodulating the electrical low-  
71              speed channels.

72        15. (Original) The optical communications system of claim 1 further comprising:  
73              a transmitter subsystem for generating the composite optical signal.

74        16. (Original) The optical communications system of claim 15 wherein the  
75        transmitter subsystem comprises:

76              at least two transmitters, each for generating one of the subbands, each transmitter  
77              using a different optical carrier frequency; and

78       an optical combiner coupled to the transmitters for optically combining the subbands  
79                    into the composite optical signal.

80       17. (Original) The optical communications system of claim 15 wherein the  
81           transmitter subsystem comprises:

82              at least two electrical transmitters for generating electrical channels;  
83              an FDM multiplexer coupled to the electrical transmitters for FDM multiplexing the  
84              electrical channels into an electrical high-speed channel, the electrical high-  
85              speed channel further including the tones; and  
86              an E/O converter coupled to the FDM multiplexer for converting the electrical high-  
87              speed channel into the composite optical signal.

88       18. (Currently Amended) A method for recovering information from a composite  
89           optical signal containing the information, the method comprising:

90              receiving a composite optical signal having at least two subbands of information and  
91              at least one tone;  
92              splitting the composite optical signal into at least two optical signals; and  
93              for each optical signal:  
94                  receiving a signal from an optical local oscillator;  
95                  detecting the optical signal using heterodyne detection and the optical local  
96                  oscillator to produce an electrical signal which includes a frequency  
97                  down-shifted version of one of the subbands and the tone of the optical  
98                  signal; and  
99              mixing the frequency down-shifted subband with the frequency down-shifted  
100             tone to produce a frequency component containing the information,  
101             wherein the step of mixing comprises one of: mixing by a signal  
102             extractor comprising a bandpass filter, a square law device, and a low  
103             pass filter configured to square an optical signal containing a tone and  
104             a sideband and mixing by a signal extractor comprising two extraction  
105             paths and a combiner, each extraction path configured to process a  
106             sideband within an electrical signal.

107        19. (Original) The method of claim 18 wherein the step of splitting the composite  
108        optical signal into at least two optical signals includes separating each optical signal from the  
109        composite optical signal.

110        20. (Original) The method of claim 18 wherein the step of splitting the composite  
111        optical signal into at least two optical signals includes splitting the composite optical signal  
112        into optical signals which are substantially the same in spectral shape.

113        21. (Original) The method of claim 18 wherein the step of splitting the composite  
114        optical signal into at least two optical signals includes wavelength division demultiplexing  
115        the composite optical signal into the optical signals.

116        22. (Original) The method of claim 18 wherein the step of splitting the composite  
117        optical signal into at least two optical signals includes wavelength selectively splitting the  
118        composite optical signal into optical signals, each optical signal including a different primary  
119        subband and attenuated other subbands.

120        23. (Original) The method of claim 18 wherein the step of detecting the optical signal  
121        using heterodyne detection and the optical local oscillator comprises:  
122              optically combining the optical local oscillator signal and the optical signal; and  
123              detecting the combined optical local oscillator signal and optical signal using square  
124              law detection.

125        24. (Original) The method of claim 18 wherein the tone for each optical signal is  
126        located at an optical carrier frequency for the corresponding subband.

127        25. (Original) The method of claim 18 wherein the tone for each optical signal  
128        includes a pilot tone located at a frequency other than an optical carrier frequency for the  
129        corresponding subband.

130        26. (Original) The method of claim 18 further comprising, for each optical signal:

131           FDM demultiplexing the frequency component into a plurality of electrical low-speed  
132           channels.

133       27. (Original) The method of claim 26 further comprising, for each optical signal:  
134           QAM demodulating the electrical low-speed channels.

135       28. (Original) The method of claim 18 further comprising:  
136           encoding the information in a composite optical signal; and  
137           transmitting the composite optical signal across an optical fiber.

138       29. (Original) The method of claim 28 wherein the step of encoding the information  
139           in a composite optical signal comprises:  
140           encoding the information onto subbands, each subband located at a different optical  
141           carrier frequency; and  
142           optically combining the subbands to produce the composite optical signal.

143       30. (Original) The method of claim 28 wherein the step of encoding the information  
144           in a composite optical signal comprises:  
145           generating electrical channels;  
146           FDM multiplexing the electrical channels into an electrical high-speed channel, the  
147           electrical high-speed channel further including the tones; and  
148           converting the electrical high-speed channel from electrical to optical form to produce  
149           the composite optical signal.

150       31. (Original) The method of claim 28 wherein the step of encoding the information  
151           in a composite optical signal comprises:  
152           receiving an optical carrier; and  
153           modulating the optical carrier with the information using a raised cosine modulation  
154           biased at a point substantially around a  $V_{\pi}$  point.